# INTERNATIONAL STANDARD

# IEC 62258-2

First edition
2005-06



## Semiconductor die products –

## Part 2:
## Exchange data formats



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

# SEMICONDUCTOR DIE PRODUCTS –

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## FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62258-2 has been prepared by IEC technical committee 47: Semiconductor devices.

The text of this standard is based on the following documents:

| FDIS | Report on voting |
|---|---|
| 47/1809/FDIS | 47/1822/RVD |

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This Part of IEC 62258 should be read in conjunction with IEC 62258-1.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

IEC 62258, as currently conceived, consists of the following parts, under the general title *Semiconductor die products*

Part 1: Requirements for procurement and use

Part 2: Exchange data formats

Part 3: Recommendations for good practice in handling, packing and storage

Part 4: Questionnaire for die users and suppliers

Part 5: Requirements for information concerning electrical simulation

Part 6: Requirements for information concerning thermal simulation

Further parts may be added as required.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

# INTRODUCTION

This International Standard is based on the work carried out in the ESPRIT 4th Framework project GOOD-DIE which resulted in the publication of the ES 59008 series of European specifications. Organisations that helped prepare this standard included the ESPRIT GOOD-DIE and ENCAST projects, the Die Products Consortium, and JEITA.

# SEMICONDUCTOR DIE PRODUCTS –

# Part 2: Exchange data formats

## 1 Scope

This part of IEC 62258 has been developed to facilitate the production, supply and use of semiconductor die products, including but not limited to

– wafers,
– singulated bare die,
– die and wafers with attached connection structures,
– minimally or partially encapsulated die and wafers.

This standard specifies the data formats that may be used for the exchange of data covered by other parts in the IEC 62258 series as well as definitions of all parameters used according to the principles and methods of IEC 61360-1, IEC 61360-2 and IEC 61360-4. It introduces a Device Data Exchange (DDX) format, with the prime goal of facilitating the transfer of adequate geometric data between the die manufacturer and the CAD/CAE user and formal information models that allow data exchange in other formats such as STEP physical file format, fin accordance with ISO 10303-21 and XML. The data format has been kept intentionally flexible to permit usage beyond this initial scope.

This standard reflects the DDX data format: version 1.2.1.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62258-1, *Semiconductor die products – Part 1: Requirements for procurement and use*[1]

IEC 61360-1:2002, *Standard data element types with associated classification scheme for electric components – Part 1: Definitions – Principles and methods*

IEC 61360-2:2002, *Standard data element types with associated classification scheme for electric components – Part 2: EXPRESS dictionary schema*

IEC 61360-4:1997, *Standard data element types with associated classification scheme for electric components – Part 4: IEC reference collection of standard data element types, component classes and terms*

ISO 6093:1985, *Information processing – Representation of numerical values in character strings for information interchange*

ISO 8601:2004, *Data elements and interchange formats – Information interchange – Representation of dates and times*

ISO 10303-21:2002, *Industrial automation systems and integration – Product data representation and exchange – Part 21: Implementation methods: Clear text encoding of the exchange structure*

[1] To be published.

## 3 Terms and definitions

For the purposes of this document, the definitions as given in IEC 62258-1 shall apply.

## 4 Requirements

Specific reference for Parameter Variables is made to the IEC 61360 Data Element Type (DET) codes, which are defined in Part 4 of IEC 61360-4.

## 5 Device Data eXchange format (DDX) file goals and usage

To facilitate the transferral of data by electronic media from the device vendor to the end-user for use within a CAD or CAE system, a data file format, **D**evice **D**ata e**X**change, (**DDX**), shall be used. This data file format has been deliberately kept flexible, to permit further enhancements and additions for future use.

It is strongly recommended that **D**evice **D**ata e**X**change files have the three letter **DDX** file extension, and a **D**evice **D**ata e**X**change file shall hereon be referred to as a **DDX** file.

**5.1** Data that are to be transferred from a device vendor to a user shall be contained in a single computer-readable DDX file, and the minimum contents of this file shall suffice a geometric CAD/CAE software design system. The file shall be textually readable, to permit simple manual verification.

**5.2** The DDX file and its data contents shall be independent of both computer machine and operating system.

**5.3** The DDX file contents shall include mechanical and interconnectivity information, but may additionally include electrical and functional data.

**5.4** The DDX file may contain data for one or more devices and shall be capable of being used as a library file by a CAD/CAE software design system. The file may contain one or more sets of data for the same device type, each having different delivery forms, such as bumped die, bare die, and Chip-Scale packaging.

**5.5** The DDX file shall be capable of being simply or automatically generated, such as by an ASCII text editor or a spreadsheet.

**5.6** The DDX file shall be capable of referencing additional external files, such as simulation and thermal model files.

**5.7** All data shall be defined in such a way that conversion to or from other exchange formats is possible, such as GDSII and CIF for geometric data of die. As close a compatibility to the existing DIE (Die Information Exchange) data as possible is desired, to facilitate simple translation of partial DIE data files.

**5.8** Definitions of parameters shall be in conformity with IEC 61360-1 (refer to Clause 5 of IEC 62258-1).

## 6 DDX file format and file format rules

NOTE Version 1.2.1 of DDX supersedes version 1.0.0 contained in ES 59008-6-1 [1][2].

The **DDX** file shall be an ASCII compatible text file with suitable line termination. Line termination will depend upon the operating system. DOS/Windows® generally uses a carriage/line-feed <CR/LF> terminator (ASCII 0Dh/0Ah), whereas UNIX® invariably relies solely upon a line-feed <LF> (ASCII 0Ah) terminator, the carriage return <CR> (ASCII 0Dh) being present by implication.

**6.1** All data not complying to the data syntax (refer to 7.3) shall be treated as a remark and, as such, ignored.

**6.2** All mandatory data shall be present. Missing data shall be flagged as an error, rendering that data unusable.

**6.3** ASCII characters 00h to 7Fh are permitted, ASCII characters 80h to FFh shall be ignored.

**6.4** All text data shall be case independent.

**6.5** Underscores "_" shall be ignored in a variable or property name, and may be used as intermediate name separators. Underscores are valid within textual string and name data.

**6.6** A comma "," shall be used as a data separator.

**6.7** All data lines shall be terminated with a semicolon, ";".

**6.8** Braces are used to open and close structures or BLOCKs. An open brace "{" shall be used to begin a structure or block, and a close brace "}" shall be used to terminate a structure or block.

**6.9** Brackets "()" shall be permitted, then ignored, in numeric data for clarity (e.g. in coordinate pairs).

**6.10** To accommodate typical spreadsheet CSV (Comma Separated Variable) format outputs, textual data may be inside double quotes "", and matching pairs of double quotes shall be ignored.

**6.11** Mathematical operations, calculations or formulae shall not be permitted within numeric data.

**6.12** Space characters (ASCII 20h) and tab characters (ASCII 09h) shall both be treated as space separators, multiple space and tab characters will syntactically be treated as a single space separator.

**6.13** Lines beginning with a hash "#" shall be treated as an intentional comment. All data on that line shall be ignored.

## 7 DDX file content

### 7.1 DDX file content rules

#### 7.1.1 Block structure

Data shall only exist within a block structure, referred to as a DEVICE block, and one or more DEVICE blocks, each containing data, may exist within a single file. Each DEVICE block is unique, and shall only contain data relevant to a single device, having a specific device form. All data within each DEVICE block shall be treated as being local and unique only to that block. (Refer to 6.8)

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2 Figures in brackets refer to the bibliography.

### 7.1.2 Parameter types

There are two types of parameters use for data, structures and variables, and these parameters shall only exist with a DEVICE block:

– A structure determines a set or multiple sets of data having different data types.
– A variable is equated to a single or multiple data of a single data type.

### 7.1.3 Data types

Data types comprise:

#### 7.1.3.1 Textual string data

All ASCII characters from ASCII 20h to ASCII 7Fh are permitted within textual data, characters including and above ASCII 80h shall be ignored. Consideration may be given to special print and display control characters to permit the printing of underscore or overscore characters. It is advised that textual string data are placed within pairs of double quotes, refer 6.10.

#### 7.1.3.2 Textual name data

All names shall be unique, and shall only consist of the following characters from the ASCII character set:-

**A-Z a-z 0-9 $ – % & ! @ _ .**

When textual name data are used to form a file name, it is advisable for the name to be limited to eight characters for the file name and to three characters for the file extension, with a point "**.**" used as the name/extension delimiter, in line with many common operating systems. It is advisable for textual name data to be placed within pairs of double quotes (refer to Clause 6).

Note that all textual data are case independent, and spaces are not permitted within a textual name.



#### 7.1.3.3 Real numeric data

Real numeric data shall comply to ISO 6093:1985, and shall consist of the following characters:

**0-9 + – . E e**

The data values may be signed, and use engineering or scientific notation, but shall not include dimensional units, e.g.

**90008, 9000.80, 9.0008E5, -5207, -5.207E3, 0.102, 102E-3**

Note that a comma "**,**" is used as a data separator, and therefore shall not be used as a replacement for a decimal point "**.**".

#### 7.1.3.4 Integer numeric data

Integer numeric data values shall comply with ISO 6093:1985, and only the characters **0** to **9** are permitted. Integers shall be unsigned, and shall not include dimensional units.

For practical purposes, an integer shall be limited to 16-bit resolution, i.e. integer values between and including 0 to 65536 only are acceptable.

#### 7.1.3.5 Date data

Date data values shall comply with ISO 8601:2000 format, Yr2000 compliant, and may include time information as well e.g.

**"YYYY-MM-DD", "YYYYMMDD", "YYYY-MM-DDTHH:MM:SS".**

### 7.1.4 Forward references

To permit single-pass parsing, no variable identifier or variable name shall be referenced prior to being defined.

### 7.1.5 Units

All units shall belong to the SI system, apart from the geometric unit of the micron ($10^{-6}$m), the inch and the mil ($10^{-3}$ inch). Only one unit of dimension shall be permitted within a single **DEVICE** block. Note that the inch and the mil are non-preferred units, and are only present due to continued common usage.

### 7.1.6 Coordinate data

In all coordinate data, the **X** coordinate shall precede the **Y** coordinate and the **Y** coordinate shall precede the **Z** coordinate (i.e. **X,Y** or **X,Y,Z**).

The **X** coordinate shall be the horizontal axis (numerically left to right), the **Y** coordinate shall be the vertical axis (numerically bottom to top), and the **Z** coordinate shall be depth axis (numerically near to far).

## 7.2 DDX DEVICE block syntax

**DEVICE device_name device_form** {
*relevant die data ……*
}

The **DDX** file may contain one or more **DEVICE** blocks, all data pertaining to a particular device shall be embedded within the relevant block. (refer to 6.1 and 7.1.1).

A **DEVICE** block is opened by the **DEVICE** keyword and opening brace "**{**", (as shown), and the **DEVICE** block is closed by the matching closing brace "**}**".

Data not within a **DEVICE** block structure shall be treated as a remark, permitting the future addition of checksum information, file creation date and historical data etc., within the **DDX** file, without affecting the actual device data.

The **device_name** is the given name by which the device shall be referred, and the **device_form** is the mechanical form of the device to which the block data pertains.

Valid data for the **device_form** variable are

- **bare_die,**
- **bumped_die,**
- **lead_frame_die**
- **minimally_packaged_device (or MPD).**